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CLAIMS

[Claim(s)]

[Claim 1]An electrostatic chuck which is provided with the following and characterized by joining said base and said surface layer in the state where said electrode was made to intervene so that exfoliation is possible.

A base which consists of dielectric ceramics.

An electrode arranged by a predetermined pattern.

A surface layer which consists of dielectric ceramics.

[Claim 2]The electrostatic chuck according to claim 1, wherein said base and said surface layer are joined using a bonding agent in the state where said electrode was made to intervene so that exfoliation is possible.

[Claim 3]The electrostatic chuck according to claim 2, wherein said bonding agent is thermoplastic resin adhesive.

[Claim 4]The electrostatic chuck according to claim 2, wherein said bonding agent is thermosetting resin adhesive.

[Claim 5]The electrostatic chuck according to claim 2, wherein said bonding agent is a low melting point metal.

[Claim 6]An electrostatic chuck given in any 1 paragraph of claims 1-5, wherein said dielectric ceramic is alumina.

[Claim 7]A semiconductor manufacturing device with which an electrostatic chuck for holding a semiconductor wafer which is provided with the following and characterized by joining said base and said surface layer in the state where said electrode was made to intervene so that exfoliation is possible is provided in a processing chamber.

A base where said electrostatic chuck consists of dielectric ceramics.

An electrode arranged by a predetermined pattern.

A surface layer which consists of dielectric ceramics.

[Claim 8]The semiconductor manufacturing device according to claim 7, wherein said base and said surface layer are joined using a bonding agent in the state where said electrode was made to intervene so that exfoliation is possible.

[Claim 9]It is a semiconductor manufacturing device to claim 8, wherein said bonding agent is thermoplastic resin adhesive.

[Claim 10]The semiconductor manufacturing device according to claim 8, wherein said bonding agent is thermosetting resin adhesive.

[Claim 11]The semiconductor manufacturing device according to claim 8, wherein said bonding agent is a low melting point metal.

[Claim 12]A semiconductor manufacturing device given in any 1 paragraph of claims 7-11, wherein said dielectric ceramic is alumina.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the semiconductor manufacturing device which has an electrostatic chuck for holding processed objects, such as a semiconductor wafer, and such an electrostatic chuck.

[0002]

[Description of the Prior Art]In the semiconductor manufacturing device, PEDISUTARU or the buck for supporting a semiconductor wafer is formed in the processing chamber. When it fixes a semiconductor wafer on this PEDISUTARU, generally what is called a mechanical clamp is used conventionally. In order to perform temperature control of the semiconductor wafer at the time of a process, a heater is built in PEDISUTARU, and it is constituted so that coolant gas may be supplied to the undersurface of a semiconductor wafer.

[0003]The temperature control of a semiconductor wafer and the homogeneity of temperature distribution are becoming the important art of determining element performance, productivity, and the yield, in connection with high integration of a semiconductor device in recent years, and minuteness making. For example, the temperature control of the semiconductor wafer in an etching process and the homogeneity of temperature distribution are important also in order to raise the productivity at the time of manufacture, and the yield it not only to to opt for the performance of a device, but.

[0004]However, when using a mechanical clamp, there is a problem that the adhesion of the semiconductor wafer to the PEDISUTARU surface is uneven, and temperature control is difficult. In these days, it is in the tendency which makes the caliber of a semiconductor wafer large to 12 inches from 8 inches for an improvement of productivity especially, and the temperature control of a large caliber wafer is more difficult. On the other hand, although generating of the particle at the time of device fabrication also caused the yield fall, a mechanical clamp may serve as a source of a particles generation.

[0005]For this reason, in recent years, what included the electrostatic chuck which adsorbs a semiconductor wafer using Coulomb force in PEDISUTARU is developed, and it is being adopted widely.

[0006]What pasted up the surface layer which consists of polyimide as sandwiches an electrode as a conventional electrostatic chuck on the base which consists of polyimide, the thing which adhered alumina to the surface of the base which consists of aluminum by the plasma-spraying method, etc. are typical.

[0007]

[Problem(s) to be Solved by the Invention]By the way, when etching a semiconductor wafer using high density plasma, the surface layer of an electrostatic chuck receives corrosion by plasma. When the corrosion of the surface layer of an electrostatic chuck progresses, the temperature distribution of a semiconductor wafer becomes uneven and element performance will be affected.

[0008]In this case, when the base and surface layer which consist of organic material like polyimide are pasted up, in order to unify both, exchange of the whole electrostatic chuck is needed, although it is desirable only for the surface layer of an electrostatic chuck to be exchangeable. Since similarly the electrostatic chuck in which the surface layer of alumina was formed by the plasma-spraying method is also impossible for exchange of only a surface layer, exchange of the whole electrostatic chuck is needed. Of course, whole PEDISUTARU must be exchanged when the electrostatic chuck is included in PEDISUTARU in one. Exchange of this whole electrostatic chuck or whole PEDISUTARU becomes a cause which makes cost of a semiconductor device high.

[0009]in light of the above-mentioned circumstances, this invention comes out. The purpose is to provide the electrostatic chuck which exchanges unnecessary the whole electrostatic chuck or whole PEDISUTARU with at the time of the corrosion of **.

[0010]

[Means for Solving the Problem]To achieve the above objects, an electrostatic chuck by this invention is provided with a base which consists of dielectric ceramics, an electrode arranged by a predetermined pattern, and a surface layer which consists of dielectric ceramics, and is characterized by joining a base and a surface layer in the state where an electrode was made to intervene, so that exfoliation is possible. It is effective that bonding agents, such as thermoplastic resin adhesive, thermosetting resin adhesive, or a low melting point metal, perform especially junction in which exfoliation with a base and a surface layer is possible. It becomes possible to exfoliate easily and to exchange a surface layer of an electrostatic chuck promptly from a base, by this composition.

[0011]As for dielectric ceramic of a base and a surface layer, it is preferred also from a field of endurance to plasma etc. that it is alumina.

[0012]This invention is characterized by semiconductor manufacturing devices, such as a plasma etching device provided with the above-mentioned electrostatic chuck.

[0013]

[Embodiment of the Invention]Drawing 1

shows roughly the sectional view of the parallel plate type plasma etching device with which this invention was applied. The etching device 10 of the graphic display is provided with the etching process chamber slack vacuum chamber 12, and this vacuum chamber 12 comprises the side attachment wall 14 and the superior lamella 16 arranged at the upper opening of this side attachment wall 14. The anode electrode 18 is attached to the superior lamella 16 via the insulator 20, and the placed opposite of PEDISUTARU 22 of the cylindrical shape as a cathode terminal is carried out to it in the parallel state to the anode electrode 18 at the pars basilaris ossis occipitalis of the side attachment wall 14. The electrostatic chuck 26 for holding the semiconductor wafer 24 which is a processed object is being arranged and fixed to the upper part of PEDISUTARU 22.

[0014]The electrostatic chuck 26 is provided with dielectric ceramic and the base 28 which consists of alumina preferably so that it may show clearly in drawing 2. The base 28 of a graphic display embodiment makes disc shape about 2 mm thick for example, and the body 32 which declines so that it can fit into the diameter reduction part 30 of the upper part of PEDISUTARU 22 is really formed in the peripheral part. The level difference part 34 is formed in the peripheral face of the body 32 of the base 28, and the base 28 is fixed to PEDISUTARU 22 by carrying out the bolt stop of the annular attachment component 36 made from silicon which engages with this level difference part 34 to PEDISUTARU 22.

[0015]The electrostatic chuck 26 is provided with the following.

The electrode 38 which consists of copper etc. which were formed in the upper surface of the base 28 by the predetermined pattern.

The surface layer 40 provided on the base 28 so that this electrode 38 might be covered.

The surface layer 40 consists of dielectric ceramic and a desirable very thin (for example, about 0.3 mm) circular film made from alumina, joins the film concerned with a bonding agent on the base 28, and is constituted.

Unlike the case of junction of organic materials, junction of ceramics has the low degree of junction, and can be exfoliated comparatively easily. As this bonding agent, although the surface layer 40 and the base 28 are strongly joined at the time of a process, When predetermined pull strength is applied, or when it heats to a predetermined temperature, by combining them, Comparatively easily, the surface layer 40 can be applied, if it seems that it can exfoliate from the base 28, For example, epoxy adhesive, the polyimide system adhesives, the polyurethane adhesive, the polyester system adhesives, polycarbonate system adhesives, and elastomeric adhesive which are thermosetting or thermoplastic resin adhesive can be used. In addition, it is usable also in metal with the comparatively low melting point (wax material), such as an indium alloy. About resin adhesive and indium alloys, such as polyimide system adhesives, also when absorbing the thermal expansion difference of the base 28 produced with the heat at the time of an etching process, and the surface layer 40, it is suitable.

[0016]From PEDISUTARU 22, the electric lead 42 is prolonged and it is grounded via the high frequency bias power supply 44 and the matching circuit 46 controlled so that the impedance of the vacuum chamber 12 becomes a predetermined value. On the other hand, from the anode electrode 18, the electric lead 48 is prolonged and is grounded. The electrode 38 of the electrostatic chuck 26 is

connected to the positive terminal of the high voltage direct current power supply 52 via the electric lead 50, and the negative terminal of DC power supply 52 is grounded.

[0017]In the composition mentioned above, in performing an etching process, after introducing the semiconductor wafer 24 in the vacuum chamber 12 and laying it in the prescribed position on the electrostatic chuck 26, it energizes to the electrode 38 and the semiconductor wafer 24 concerned is fixed on the electrostatic chuck 26.

[0018]Subsequently, the vacuum system which is open for free passage in the vacuum chamber 12 is operated, and the pressure in the vacuum chamber 12 is reduced to a predetermined level. Then, an etchant gas (generally argon gas) is introduced in the vacuum chamber 12 from an etchant gas supply source (not shown). And if the high frequency bias power supply 44 is switched on and high-frequency power is impressed between the electrodes 18 and 22, discharge will take place to an etchant gas and plasma will occur. The positive ion in plasma is accelerated toward PEDISUTARU 22 by which bias was applied to negative, and, thereby, the semiconductor wafer 24 on the electrostatic chuck 26 is etched.

[0019]As mentioned above, the plasma generated at the time of an etching process corrodes the surface layer 40 of the electrostatic chuck 26. The corrosiveness of O₂ plasma produced when etching especially the oxide film on the semiconductor wafer 24 is gradually corroded toward the inside from the outer periphery part, even if it is strong and the surface layer 40 of the electrostatic chuck 26 is formed from alumina with corrosion resistance. corrosion -- being certain -- if a grade progresses, the adhesion of the semiconductor wafer 24 and the electrostatic chuck 26 will fall, and equalization of temperature control or temperature distribution will become difficult. In this case, when it was the former, the whole electrostatic chuck needed to be exchanged at least, but in the electrostatic chuck 26 by this invention, since the surface layer 40 can be exfoliated from the base 28, it becomes possible to exchange only the surface layer 40 for a new thing.

[0020]As mentioned above, although the suitable embodiment of this invention was described in detail, it cannot be overemphasized that this invention is not restricted to the above-mentioned embodiment. For example, although the above-mentioned embodiment explained what carried out pattern formation of the electrode to the upper surface of the base, of course, it is contained in the embodiment of this invention also about the thing in which the electrode was formed on the undersurface of the surface layer.

Although the above-mentioned embodiment is related with an etching device, this invention is applicable also to the plasma device of other form of generating and using plasma.

[0021]

[Effect of the Invention]As stated above, according to this invention, even if the surface layer of an electrostatic chuck corrodes, only a surface layer requires neither time and effort nor expense as compared with the case where an electrode should just exchange for the undersurface the surface layer by which pattern formation was carried out, and exchanges the whole electrostatic chuck or whole PEDISUTARU. Since the clearing work of a surface layer is also easy work in comparison of exfoliation and junction, the shutdown time of a device can be shortened and it becomes possible to correspond to the evil by corrosion promptly. Therefore, temperature control uniform temperature distribution and reliable can be realized, and it contributes to improvement in device performance, productivity, and the yield by extension.

[Translation done.]